REMARKS

In the Office Action dated February 5, 2007, claims 1-7, 9-23 and 25-33 were rejected under 35 U.S.C. §103 (a) as being unpatentable over Clarke in view of Prince. Claims 8 and 24 were rejected under 35 U.S.C. §103(a) as being unpatentable over Clarke and Prince, further in view of Schneider.

These rejections are respectfully traversed for the following reasons.

In the Clarke article, analysis of the stability of a plaque deposit in a vessel is undertaken by obtaining a number of different magnetic resonance images of a cross-section of the vessel, including the plaque deposit or a portion thereof. These magnetic resonance images are respectively obtained with different imaging sequences, or at least different imaging parameters of the same imaging sequence. In this context, it must be noted that in magnetic resonance imaging, the term "imaging sequence" merely refers to a sequence of pulses, namely radio-frequency pulses and gradient pulses, and does not necessarily mean that a sequence of (i.e., multiple) magnetic resonance images are obtained. An imaging sequence may be repeated a number of times in succession, with a slight incremental variation in a parameter, such as the phase-coding gradient, being undertaken in each repetition, but each imaging sequence produces only one magnetic resonance image, namely a "snapshot" of the region of interest. A printout from a standard magnetic resonance imaging website (Magnetic Resonance Technology Information Portal) is attached hereto as Exhibit "A" substantiating the aforementioned standard definition and understanding of the term "imaging sequence" in the context of magnetic resonance imaging.

As discussed below, it is true that in some types of imaging sequences, namely in dynamic imaging sequences, multiple images are obtained, but these are images respectively representing slices of an overall volume to be imaged, and again each slice represents only a "snapshot" of the region from which data are obtained with a given set of operating parameters.

In the subject matter disclosed and claimed in the present application, the stability of a plaque deposit in a vessel is analyzed (categorized) by repeatedly taking the same "snapshot" of the same vessel cross section with the same imaging sequence (i.e., the same pulse sequence) while injected contrast agent interacts with the plaque an the surrounding vessel wall. As is well known, and as explained in the introductory portion of the present specification, an injected contrast agent interacts non-uniformly over time with plaque and blood vessels. At a certain time after the injection of the contrast agent, when the contrast agent reaches the region of interest, an enrichment phase occurs during which the contrast agent is absorbed into tissue in the region of interest. This is followed by a flushing phase wherein the contrast agent is naturally eliminated from the tissue in question. Because, in accordance with the present invention, the same magnetic resonance image "snapshot" is being obtained with the same imaging sequence and of the same cross-section of the vessel, the only changing parameter as the snapshots are successively obtained is the chronologically non-uniform interaction of the contrast agent with the plaque and the vessel. Moreover, two of such "snapshots" are obtained after the injection of the contrast agent, and

In accordance with the present invention the intensity distribution in those respective "snapshots" is intentionally not the same. From the image obtained

before the injection of the contrast agent, and the images obtained after the injection of the contrast agent with the contrast agent behaving non-uniformly with respect to time, the plaque can then be categorized.

As noted above, in the Clarke article it is intended to obtain the different magnetic resonance images of the cross-section of the plaque-containing vessel with different imaging sequences, or with an imaging sequence wherein the operating parameters are varied from data acquisition-to-data acquisition. This is explained in the second paragraph in Section 2.1 of the Clarke article which identifies a number of different spin echo weightings. The images referred to by the Examiner in Figure 1 of the Clarke article are specifically labeled as being obtained with different imaging sequences.

Moreover, as the Examiner has acknowledged the Clarke article does not disclose the use of a contrast agent for obtaining the aforementioned images. For that purpose, the Examiner relied on the Prince reference. The Prince reference uses the term "imaging sequence," but does not always clearly differentiate when that term, by happenstance, involves obtaining multiple magnetic resonance images. For example, in the paragraph at column 5, lines 33-41, it is clear that the term "T1 sequence" is consistent with the usage of that term in Exhibit "A", as well as in the Clarke article. The paragraph at column 5, lines 43-50, however refers to a "3D volume sequence." The term "sequence" in that context still means a collection of radio-frequency and gradient pulses but, by happenstance in a volume sequence a number of individual slices are imaged which collectively form the volume of interest. Nevertheless, none of the slices are identical, or at least are not intended to be identical, because the collection of slices is intended to represent a volume of

interest and therefore the slices necessarily represent different cross-sections of that volume.

Therefore, Applicants submit that the Prince reference does not disclose or suggest repeatedly obtaining an image of the same cross-section of the plaque-containing vessel, as set forth in the claims of the present application. In the original claim language, the first image was stated to be obtained of a cross-section of a vessel containing plaque, and the second and third images have always been stated to be obtained of "said" cross-section, meaning that the same cross-section is always imaged in accordance with the present invention.

Moreover, in the Prince reference it is always intended that the image will be obtained with the contrast agent at its highest concentration in the region of interest. This is stated at numerous locations in the Prince reference, and is emphasized at column 16, lines 56-60. It is well known that the data that are entered into the central region of k-space represent the highest contrast information, and therefore it is always desirable to capture the most interesting features of any magnetic resonance image in the data that are entered into the central region of k-space. In the Prince reference, while acknowledging the time-varying nature of absorption of the contrast agent, it is taught at numerous locations to always obtain the data that will be entered into the central region of k-space at a time when the enrichment is at its maximum. This is stated at column 16, lines 69-64. This is also stated at column 10, lines 38-41, and the entirety of the discussion referring to "injection parameters" beginning at column 11 of the Prince reference is intended to correlate the time of injection or the injection rate so as to be able to predict when the maximum

enrichment of the region of interest will occur, so as to, in turn, enable data in the central region of k-space to be acquired at that time.

Therefore, the teaching of the Prince reference is that the magnetic resonance data should always be obtained, to the extent possible, when the contrast agent is *not varying* in its absorption by the plaque and surrounding vessels. By contrast, the Prince reference teaches that the magnetic resonance data should be obtained while the contrast agent is substantially uniform in the region of interest, namely when it is at its maximum enrichment.

Therefore, even if the Clarke reference were modified in accordance with the teachings of the Prince reference, this would result in no more than the different magnetic resonance images, obtained respectively with different imaging sequences, being obtained with a contrast agent that is injected at time so as to ensure that the maximum enrichment occurs at the time image data (or at least central k-space image data) are obtained. There is no teaching in either of the Clarke or Prince references to obtain images of any type with the contrast agent concentration intentionally deviating from the maximum enrichment, much less with all other parameters being maintained the same from image-to-image, as disclosed and claimed in the present application.

These arguments are also applicable to the rejection of claims 8 and 24 under 35 U.S.C. §103(a) as being unpatentable over Clarke and Prince, further in view of Schneider. Even if the Examiner's statements regarding the teachings of the Schneider reference are correct, modifying the Clarke/Prince combination in accordance with those teachings still would not result in the subject matter of either of claims 8 or 24, which respectively depend from independent claims 1 and 17/

All claims of the application are therefore submitted to be in condition for allowance, and early reconsideration of the application is respectfully requested.

Submitted by,

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MR-Technology

'Imaging Sequence'

Result : Searchterm **'Imaging Sequence'** found in **2** terms [●] and **19** definitions [●]

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Imaging Sequence

An **imaging sequence** is in magnetic resonance imaging a predefined set of radio frequency - and gradient pulses to excite the hydrogen nuclei of the object being imaged.

Chemical Shift Selective Imaging Sequence

(CHESS) A sequence for water suppression in proton MR spectroscopy and for water or fat suppression in MR imaging. This technique uses a frequency-selective 90° pulse to selectively excite the water signal, followed by a spoiler gradient to dephase the resulting magnetization. The gradients may be repeated several times in different directions to increase its effectiveness.
See also Chemical Shift Imaging and Chemical Shift.

Further Reading:

Basics:

- Chemical shift selective missing pulse steady state
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EXHIBIT
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